March 2006

NC7WZU04
TinyLogic® UHS Dual Unbuffered Inverter

General Description

The NC7WZU04 is a dual unbuffered inverter from Fairchild's Ultra High Speed Series of TinyLogic® in the space saving SC70 6-lead package. The special purpose unbuffered circuit design is intended for crystal oscillator or analog applications. The device is fabricated with advanced CMOS technology to achieve ultra high speed with high output drive while maintaining low static power dissipation over a very broad V_{CC} operating range. The device is specified to operate over the 1.65V to 5.5V V_{CC} range. The inputs are high impedance when V_{CC} is 0V. Inputs tolerate voltages up to 7V independent of V_{CC} operating voltage.

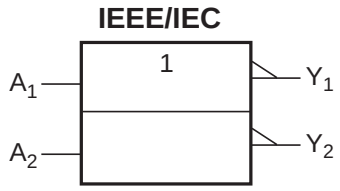
Features

- Space saving SC70 6-lead package
- Ultra small MicroPak™ leadless package
- Unbuffered for crystal oscillator and analog applications
- Balanced output drive: ±8mA at 4.5V V_{CC}
- Broad V_{CC} operating range: 1.65V to 5.5V
- Low quiescent power: I_{CC} < 1µA at 5V V_{CC}, T_A = 25°C

Ordering Information

Order Number	Package Number	Package Code Top Mark	Package Description	Supplied As
NC7WZU04P6X	MAA06A	ZU4	6-Lead SC70, EIAJ SC88, 1.25mm Wide	3k Units on Tape and Reel
NC7WZU04L6X	MAC06A	B5	6-Lead MicroPak, 1.0mm Wide	5k Units on Tape and Reel

Logic Symbol



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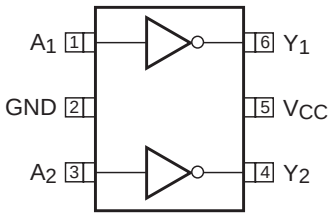
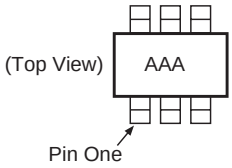
Connection Diagrams

Pin Assignment for SC70



(Top View)

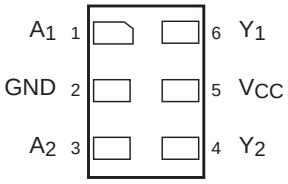
Pin One Orientation Diagram



AAA represents Product Code Top Mark – see ordering code

Note: Orientation of Top Mark determines Pin One location. Read the top product code mark left to right, Pin One is the lower left pin (see diagram).

Pad Assignments for MicroPak



(Top Through View)

Pin Descriptions

Pin Name	Description
A_1, A_2	Data Inputs
Y_1, Y_2	Outputs

Function Table

$Y = \overline{A}$

Input	Output
A	**Y**
L	H
H	L

H = HIGH Logic Level L = LOW Logic Level

Absolute Maximum Ratings

The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	–0.5V to +7V
V_{IN}	DC Input Voltage	–0.5V to +7V
V_{OUT}	DC Output Voltage	–0.5V to +7V
I_{IK}	DC Input Diode Current @ $V_{IN} \le -0.5V$	–50mA
I_{OK}	DC Output Diode Current @ $V_{OUT} < -0.5V$ $V_{OUT} > 0.5V$, V_{CC} = GND	 –50mA +50mA
I_{OUT}	DC Output Current	±50mA
I_{CC}/I_{GND}	DC V_{CC}/GND Current	±100mA
T_{STG}	Storage Temperature	–65°C to +150°C
T_J	Junction Temperature under Bias	150°C
T_L	Junction Lead Temperature (Soldering, 10 seconds)	260°C
P_D	Power Dissipation @ +85°C	180mW

Recommended Operating Conditions(1)

Symbol	Parameter	Rating
V_{CC}	Supply Voltage Operating	1.8V to 5.5V
V_{CC}	Supply Voltage Data Retention	1.5V to 5.5V
V_{IN}	Input Voltage	0V to 5.5V
V_{OUT}	Output Voltage	0V to V_{CC}
T_A	Operating Temperature	–40°C to +85°C
θ_{JA}	Thermal Resistance	350°C/W

Note:

1. Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	Conditions		V_{CC} (V)	T_A = +25°C Min	+25°C Typ	+25°C Max	-40°C to +85°C Min	-40°C to +85°C Max	Units
V_{IH}	HIGH Level Input Voltage			1.8 to 2.7	0.85 V_{CC}			0.85 V_{CC}		V
				3.0 to 5.5	0.8 V_{CC}			0.8 V_{CC}		
V_{IL}	LOW Level Input Voltage			1.8 to 2.7			0.15 V_{CC}		0.15 V_{CC}	V
				3.0 to 5.5			0.2 V_{CC}		0.2 V_{CC}	
V_{OH}	HIGH Level Output Voltage	V_{IN} = V_{IL}	I_{OH} = -100µA	1.65	1.55	1.65		1.55		V
				1.8	1.6	1.79		1.6		
				2.3	2.1	2.29		2.1		
				3.0	2.7	2.99		2.7		
				4.5	4.0	4.48		4.0		
		V_{IN} = GND	I_{OH} = -2mA	1.65	1.29	1.52		1.29		V
			I_{OH} = -2mA	2.3	1.9	2.19		1.9		
			I_{OH} = -4mA	3.0	2.4	2.82		2.4		
			I_{OH} = -6mA	3.0	2.3	2.73		2.3		
			I_{OH} = -8mA	4.5	3.8	4.24		3.8		
VOL	LOW Level Output Voltage	V_{IN} = V_{IH}	I_{OL} = 100µA	1.65		0.01	0.2		0.2	V
				1.8		0.01	0.2		0.2	
				2.3		0.01	0.2		0.2	
				3.0		0.01	0.3		0.3	
				4.5		0.01	0.5		0.5	
		V_{IN} = V_{CC}	I_{OL} = 2mA	1.65		0.10	0.24		0.24	V
			I_{OL} = 2mA	2.3		0.12	0.3		0.3	
			I_{OL} = 4mA	3.0		0.19	0.4		0.4	
			I_{OL} = 6mA	3.0		0.29	0.55		0.55	
			I_{OL} = 8mA	4.5		0.29	0.55		0.55	
I_{IN}	Input Leakage Current	V_{IN} = 5.5V, GND		0 to 5.5			±0.1		±1.0	µA
I_{CC}	Quiescent Supply Current	V_{IN} = 5.5V, GND		1.65 to 5.5			1.0		10	µA
I_{CCPEAK}	Peak Supply Current in Analog Operation	V_{OUT} = Open, V_{IN} = Adjust for Peak I_{CC} Current		1.8		0.2				mA
				2.5		2				
				3.3		5				
				5.0		15				

AC Electrical Characteristics

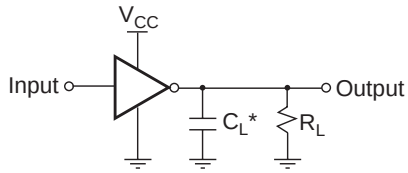
Symbol	Parameter	Conditions	V_{CC} (V)	T_A = +25°C Min	+25°C Typ	+25°C Max	−40°C to +85°C Min	−40°C to +85°C Max	Units	Figure Number
t_{PLH}, t_{PHL}	Propagation Delay	C_L = 15pF, R_L = 1MΩ	1.65	1.5	5.5	9.8	1.5	11.0	ns	Figure 1 Figure 3
			1.8	1.5	4.6	8.1	1.5	8.9		
			2.5 ± 0.2	1.2	3.3	5.7	1.2	6.3		
			3.3 ± 0.3	0.8	2.7	4.1	0.8	4.5		
			5.0 ± 0.5	0.5	2.2	3.3	0.5	3.6		
		C_L = 50pF, R_L = 500Ω,	3.3 ± 0.3	1.2	4.0	6.4	1.2	7.0	ns	Figure 1 Figure 3
			5.0 ± 0.5	0.8	3.4	5.6	0.8	6.2		
C_{IN}	Input Capacitance		0		3				pF	
C_{PD}	Power Dissipation Capacitance	Note 2	3.3		3.5				pF	Figure 2
			5.0		5.5					

Note:

2. C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. (See Figure 2.) C_{PD} is related to I_{CCD} dynamic operating current by the expression:

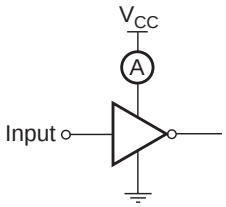
$I_{CCD} = (C_{PD})(V_{CC})(f_{IN}) + (I_{CC}static)$.

AC Loading and Waveforms



*C_L includes load and stray capacitance.
Input PRR = 1.0MHz; t_W = 500ns

Figure 1. AC Test Circuit



Application Note: When operating the NC7WZU04's unbuffered output stage in its linear range, as in oscillator applications, care must be taken to observe maximum power rating for the device and package. The high drive nature of the design of the output stage will result in substantial simultaneous conduction currents when the stage is in the linear region. See the I_{CCPEAK} specification on page 2.

Input = AC Waveform; t_r, t_f = 1.8ns;
PRR = 10MHz; Duty Cycle = 50%

Figure 2. I_{CCD} Test Circuit

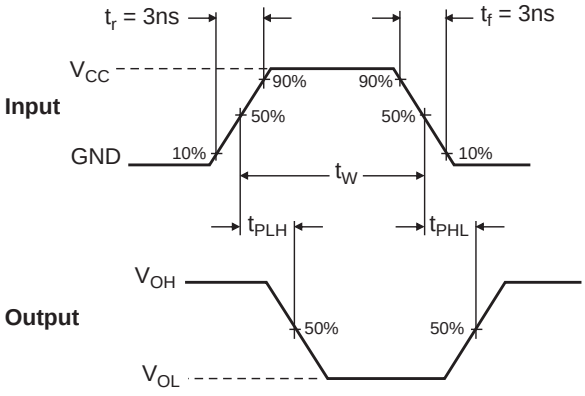


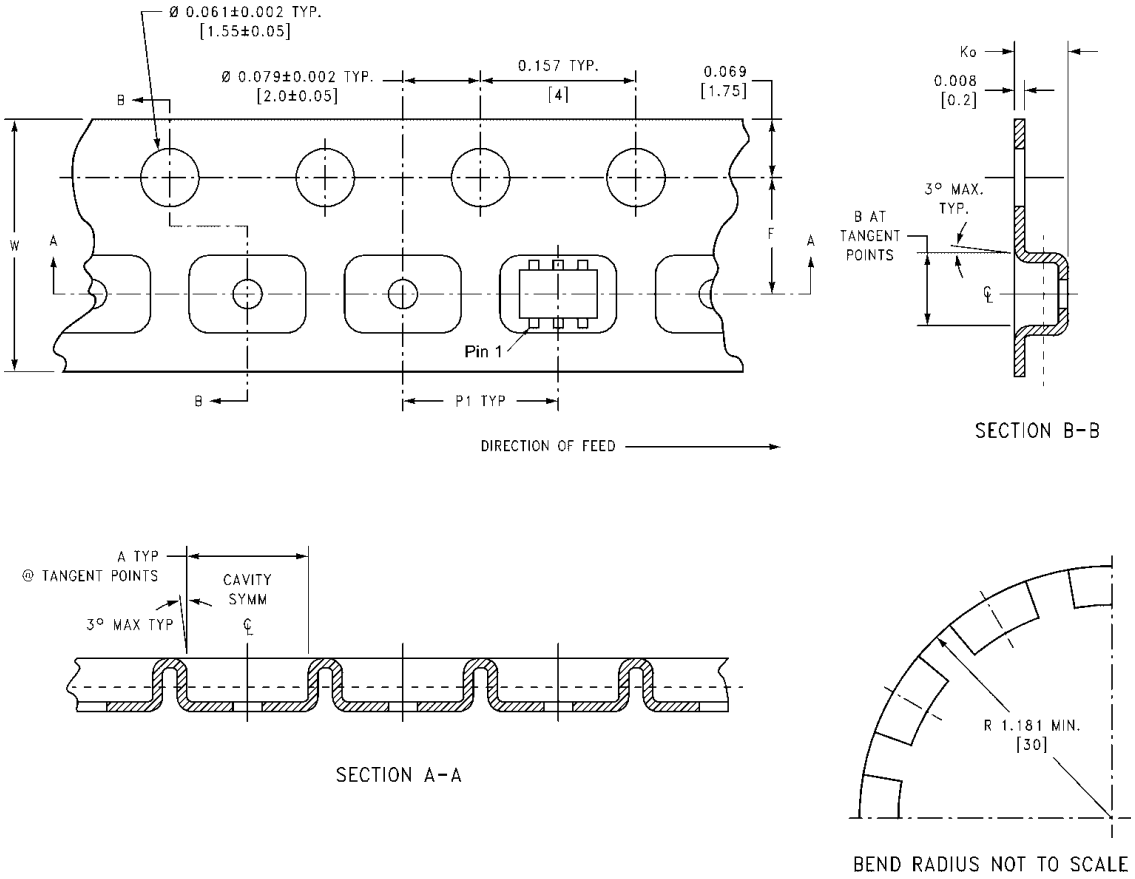
Figure 3. AC Waveforms

Tape and Reel Specification

Tape Format for SC70

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
P6X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

Tape Dimension inches (millimeters)



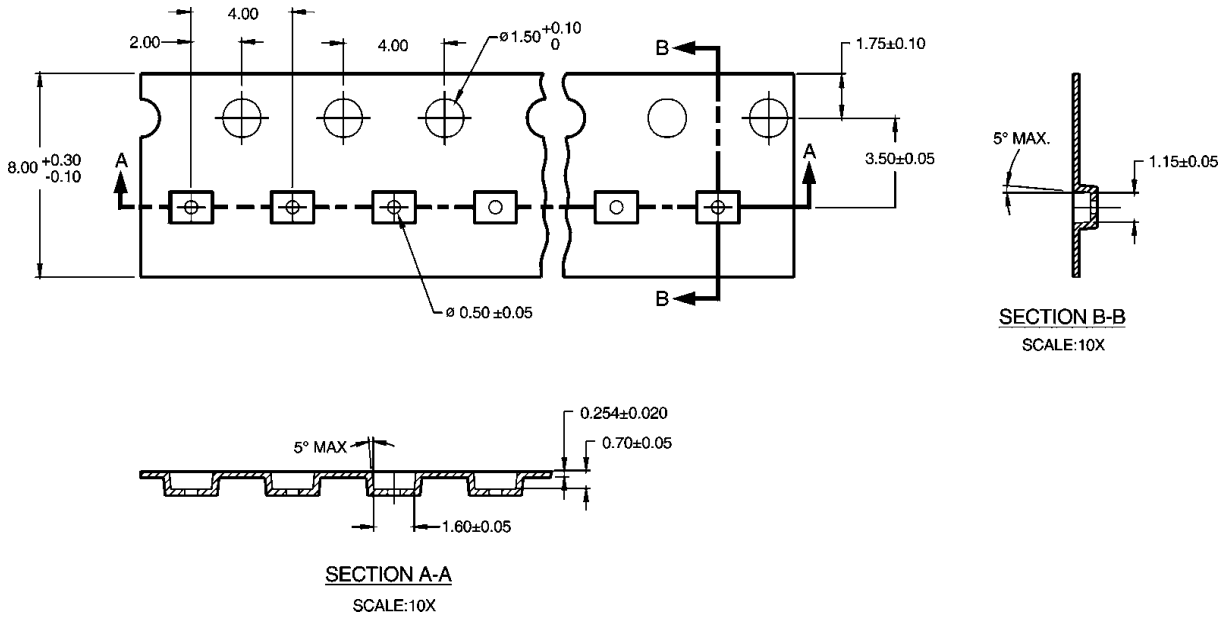
Package	Tape Size	Dim A	Dim B	Dim F	Dim K_O	Dim P1	Dim W
SC70-6	8mm	0.093 (2.35)	0.096 (2.45)	0.138 ± 0.004 (3.5 ± 0.10)	0.053 ± 0.004 (1.35 ± 0.10)	0.157 (4)	0.315 ± 0.004 (8 ± 0.1)

Tape and Reel Specification (Continued)

Tape Format for MicroPak

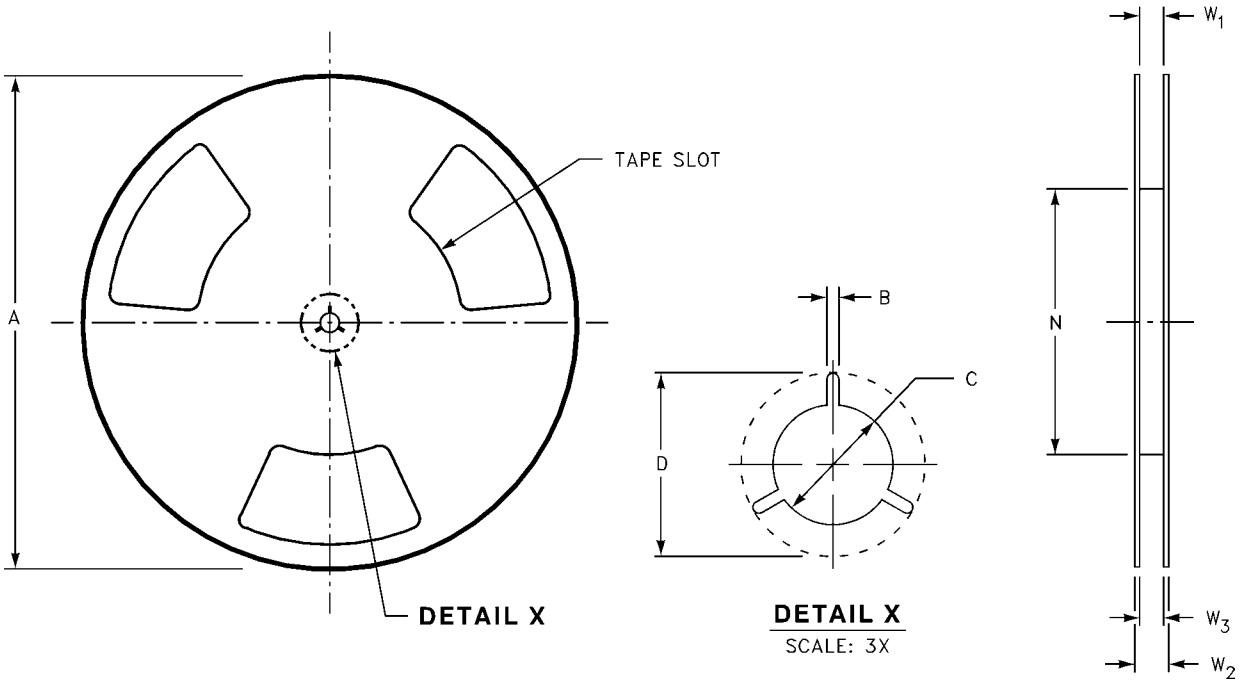
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
L6X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

Tape Dimension inches (millimeters)



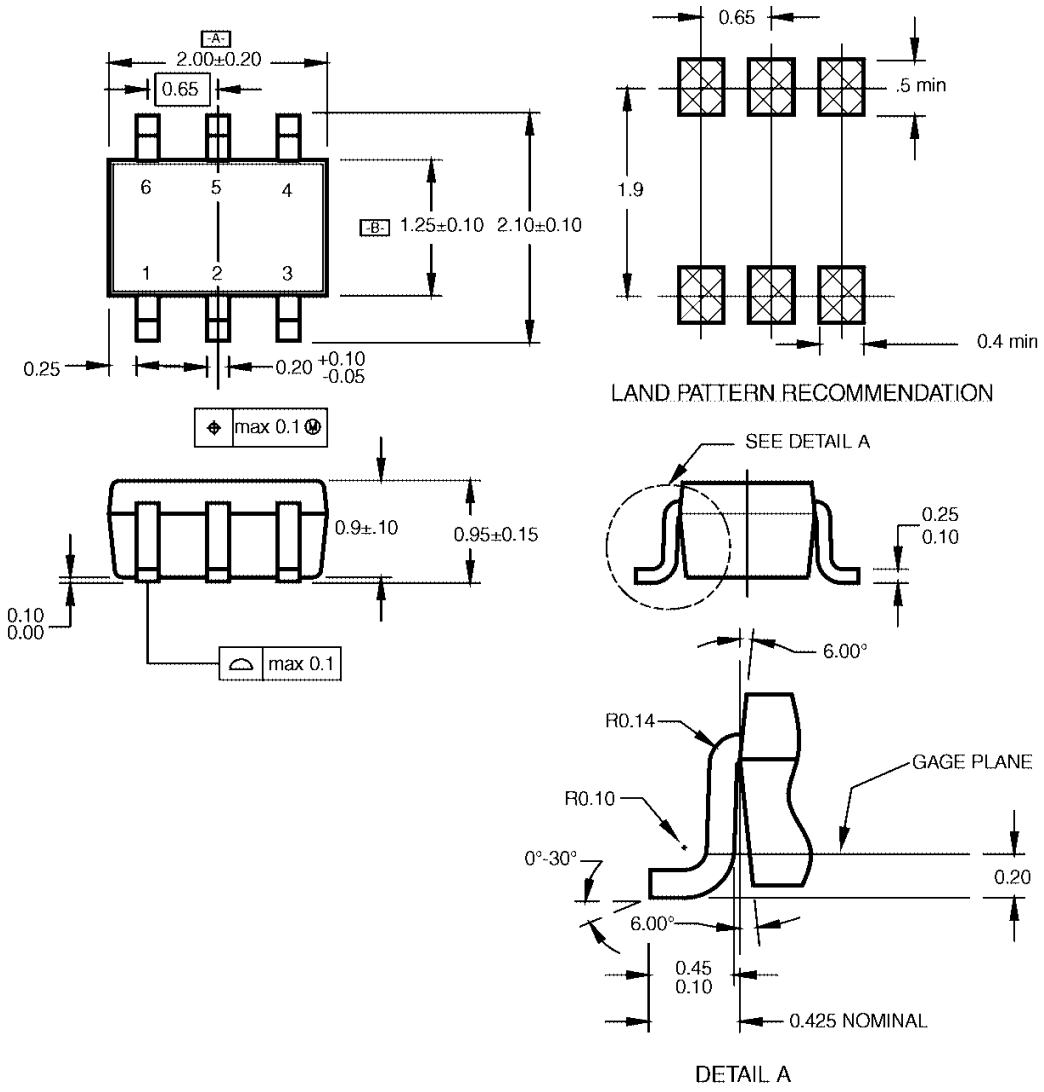
Tape and Reel Specification (Continued)

Reel Dimension for MicroPak inches (millimeters)



Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 + 0.059/–0.000 (8.40 + 1.50/–0.00)	0.567 (14.40)	W1 + 0.078/–0.039 (W1 + 2.00/–1.00)

Physical Dimensions inches (millimeters) unless otherwise noted



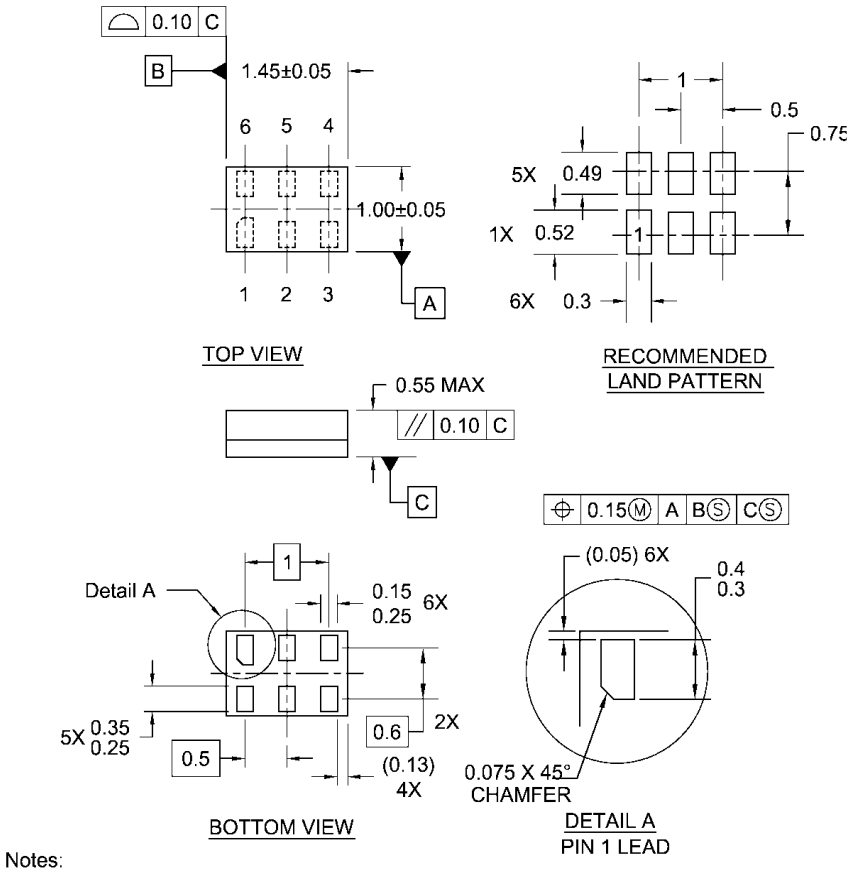
NOTES:

A. CONFORMS TO EIAJ REGISTERED OUTLINE DRAWING SC88.
B. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.
C. DIMENSIONS ARE IN MILLIMETERS.

MAA06ARevC

6-Lead SC70, EIAJ SC88, 1.25mm Wide
Package Number MAA06A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



Notes:

1. JEDEC PACKAGE REGISTRATION IS ANTICIPATED
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-1994

MAC06ARevB

6-Lead MicroPak, 1.0mm Wide
Package Number MAC06A

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